AMMONITES FROM THE DOULTING CONGLOMERATE BED (UPPER BAJOCIAN, JURASSIC) OF SOMERSET

by C. F. PARSONS

ABSTRACT. An examination of ammonites from the Doulting Conglomerate Bed (Doulting, Somerset, England) has shown that this bed is Subfurcatum rather than Garantiana Zone in age. This is only the second fully authenticated area of outcrop of this Upper Bajocian Zone in England. The ammonites are described, and their bearing on the correlation of the Upper Inferior Oolite from the Mendips north to the Cotswolds is discussed.

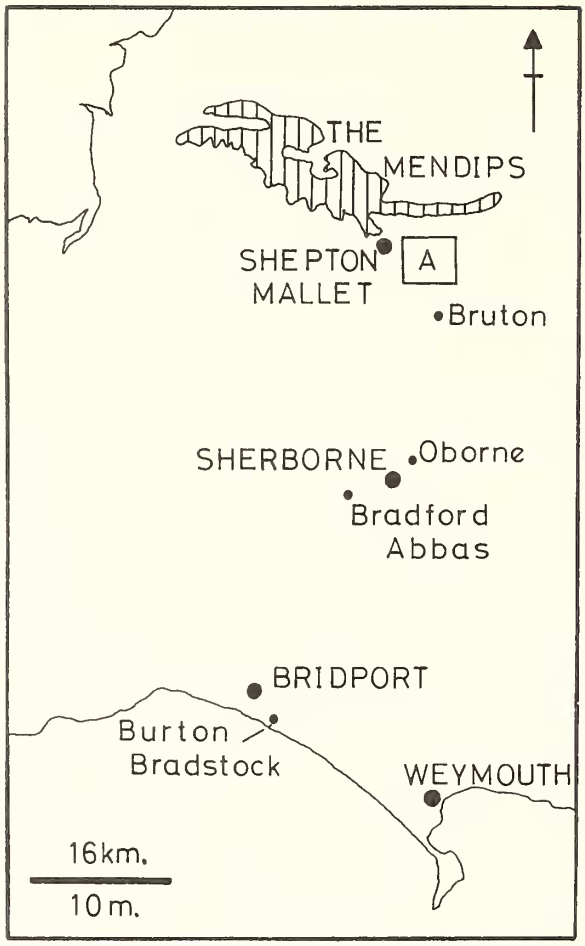
THE Subfurcatum Zone of the Upper Bajocian is probably the most poorly represented of any British Jurassic Zone. The area of outcrop of rocks of this age is so small that it has been suggested that *Strenoceras subfurcatum* (Zieten) was restricted by ecological rather than stratigraphic factors (Stamp 1925). However, the limited lateral range of the Subfurcatum Zone in Britain is merely due to erosion and non-deposition, since beds of this age are widespread elsewhere in Europe. Until recently the only fully authenticated occurrence of the Subfurcatum Zone in England was in the Cadomensis Bed to the east of Sherborne, Dorset (Hudleston and Woodward 1885, p. 193; Buckman 1893, p. 501), and its lateral equivalent to the west, the Irony Bed, which is well seen at Half-Way House and Bradford Abbas, Dorset (Torrens 1969*a*, p. A28; Buckman 1893, p. 487); see text-figs. 1 and 2. It has now been possible to confirm the occurrence of Subfurcatum Zone ammonites in the Red Conglomerate Bed of south Dorset (Gatrall, Jenkyns and Parsons 1972) and it would seem likely that much of the highly condensed Red Conglomerate–Irony Bed horizon found over Dorset and south Somerset is of this age—see Table 1 for Zonal scheme used here.

TABLE 1. Zones and Subzones of the Upper Bajocian Substage in England.

Zones	*Subzones*
Parkinsoni	Bomfordi
	Truellei
Garantiana	Acris
	Dichotoma
Subfurcatum	Baculata
	Polygyralis
	Banksi

The only other record of Subfurcatum Zone ammonites in the British Isles is from the Garantiana Clay of the Inner Hebrides. Buckman attributed this bed to both the Subfurcatum and Garantiana Zones (Lee 1920). A recent revision of the ammonites

[Palaeontology, Vol. 18, Part 1, 1975, pp. 191–205, pl. 36.]

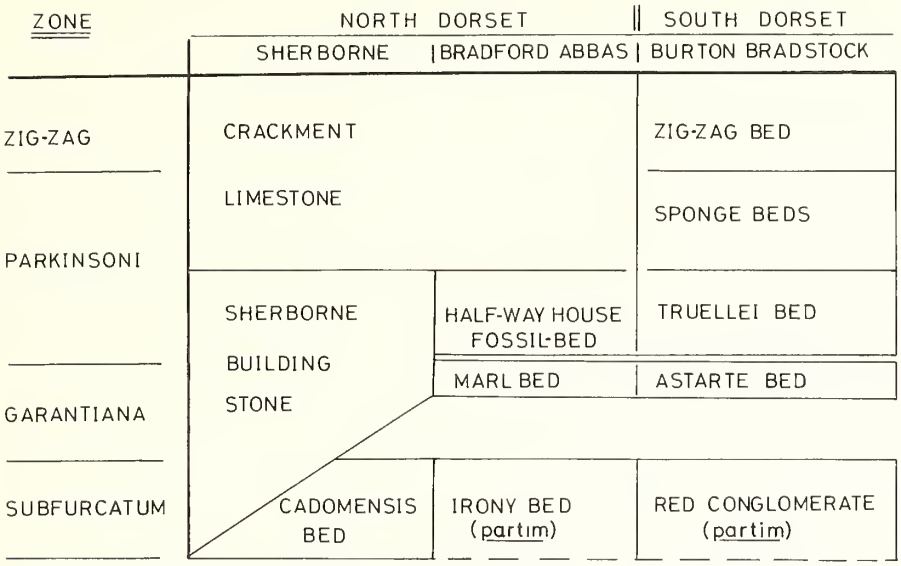


TEXT-FIG. 1. An outline map of part of southern England, showing the main localities mentioned in the text. The square A marks the area shown in text-fig. 3.

has suggested that the Garantiana Clay is solely Subfurcatum Zone in age (Morton 1971). However, the great similarity between the Garantiana Zone *Strenoceras* (*Garantiana*)/*Strenoceras* (*Pseudogarantiana*) dimorphic group and the *S.* (*Baculatoceras*)/*S.* (*Strenoceras*) group of the Subfurcatum Zone would preclude their separation on the basis of the present fragmentary and poorly preserved specimens. I remain unconvinced of the Subfurcatum Zone age of the Garantiana Clay.

A NEW OCCURRENCE OF THE SUBFURCATUM ZONE

Ammonites recently collected, together with those from existing museum collections, have proved that the Doulting Conglomerate Bed (Richardson 1907) is Subfurcatum rather than Garantiana Zone in age. The Conglomerate Bed at Doulting (near Shepton Mallet, Somerset) is a highly fossiliferous, bioclastic limestone, containing

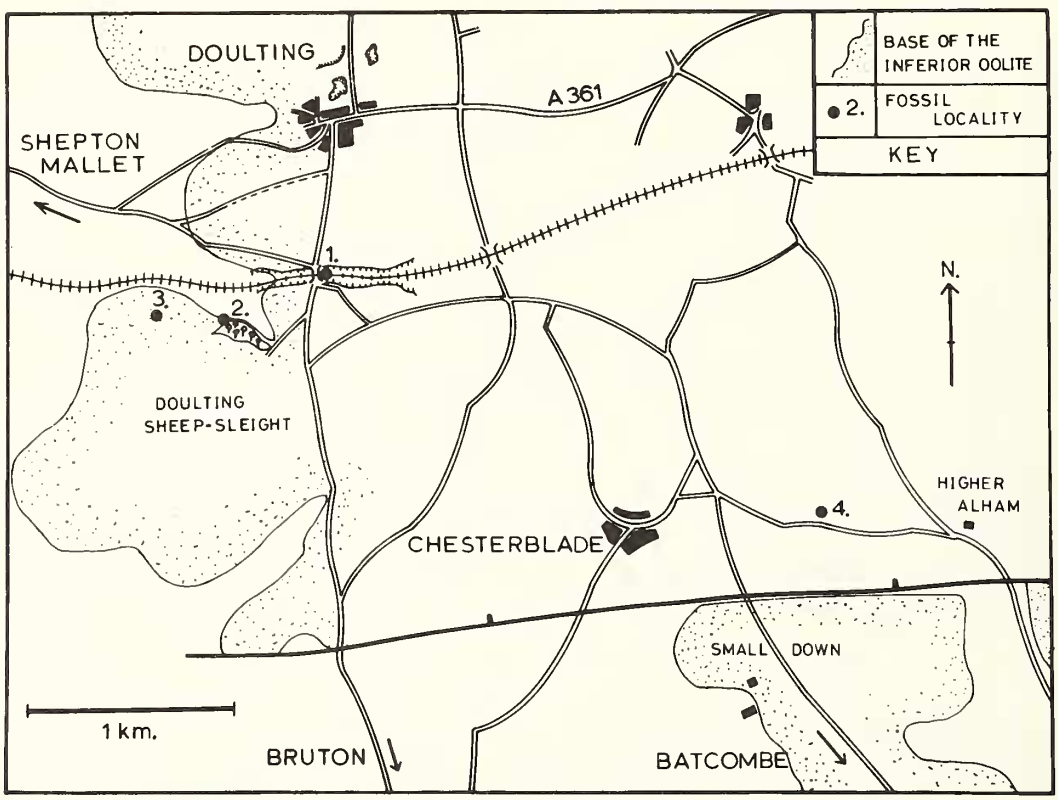


TEXT-FIG. 2. The lithostratigraphic subdivisions of the Upper Inferior Oolite as seen in Dorset, taken from S. Buckman (1893 and 1910), Richardson (1930), and Torrens (1969*a*).

serpulid- and limonite-encrusted lithoclasts (cf. the 'Snuff-boxes' described by Gatrall *et al.* 1972). It is some 0·35 m thick and is now only poorly exposed. When described by Richardson (1907, 1916) it was still to be seen at the base of the Inferior Oolite at Doulting railway cutting (National Grid Reference ST 645 425—Locality 1, text-fig. 3), where it rests unconformably on the Upper Lias (Bed VI, Richardson 1907, p. 390). In both of his papers Richardson correlated the Conglomerate Bed with the Upper Trigonia Grit of the Cotswolds, which is Garantiana Zone in age (Arkell 1956, p. 31). The only ammonite recorded by Richardson (1907, p. 300) in his two accounts of this bed was a single specimen of *Leptosphinctes* ('*Perisphinctes*') cf. *davidsoni* (S. Buckman), which is now in the Reading University Collections (LRS 3094). However, subsequent to his 1907 publication, Richardson produced a critical catalogue of the John Phyllis Collection, housed in the Shepton Mallet Museum (Richardson 1908, pp. 516–517). Here he listed several ammonites of Sauzei, Humphriesianum, Subfurcatum, and Garantiana Zone age, supposedly from the Doulting area, which he considered to have come from the Conglomerate Bed. The Shepton Mallet geological material has since been stored in a basement. Many labels have been destroyed or lost, making much of the material valueless. However, several ammonites do still exist which can be identified from their labels as coming from the Phyllis Collection. One, *Otoites* cf. *sauzei* (d'Orb.), possibly that recorded by Richardson, still has an original label claiming its locality as the Doulting district. The matrix suggests that this specimen came from either the Pecten Bed of the Cole Syncline, Bruton, Somerset (Richardson 1916), or from further south in the Sherborne district of north Dorset. Two other ammonites, both septate nuclei, and showing the characteristic Conglomerate Bed matrix, are undoubtedly amongst those listed by Richardson. These, *Stephanoceras* sp. and *Leptosphinctes* aff. *davidsoni*, are discussed

in greater detail below. On the available evidence from museum material there thus seemed little reason to doubt Richardson's Garantiana Zone correlation for the Conglomerate Bed, provided that one considered the *Stephanoceras* sp. as reworked. However, a unique collection of ammonites made subsequently by C. Cornfield during the course of an undergraduate mapping exercise has changed this interpretation. Specimens of the following were collected from localities 2 and 3 (see text-fig. 3): *Teloceras banksi* (J. Sow.), *Cadomites deslongchampsi* (d'Orb.), *Strenoceras* (*Strenoceras*) cf. *subfurcatum* (Zieten), and *Orthogarantiana* sp. As will be shown below, the total fauna of the Conglomerate Bed can only be reconciled with the basal Banksi Subzone of the Subfurcatum Zone. This then is the first English record of the Subfurcatum Zone, outside of Dorset.

Unfortunately exposures of the Conglomerate Bed are now very poor, thus locality 2 (text-fig. 3) is nothing more than material excavated by badgers, whilst locality 3 is a small natural exposure along the edge of the scarp of Doulting Sheepsleight. However, all the ammonites described below have the highly characteristic matrix of the Conglomerate Bed within their body chambers and there thus can be no question as to their correct horizon. Similarly they cannot be considered reworked, although their fragmentary and serpulid encrusted state does suggest that they were lying on the sea floor for some time before being incorporated in any sediment.



TEXT-FIG. 3. A sketch map of the area south of Doulting, showing the localities mentioned in the text.

SYSTEMATIC DESCRIPTIONS

Abbreviations. Numbers preceded by the following letters refer to specimens in these Institutions and collections:

BMNH	British Museum (N.H.), London.
IGS	Institute of Geological Sciences, London.
L	Manchester City Museum.
LR	Richardson Collection, Reading University.
CP	The author's collection, Liverpool University.

Superfamily STEPHANOCERATACEAE Neumayr, 1875
Family STEPHANOCERATIDAE Neumayr, 1875
Genus CADOMITES Munier-Chalmas, 1892
Cadomites (*Cadomites*) *deslongchampsi* (d'Orbigny)

Plate 36, fig. 4*a* and 4*b*; text-fig. 4

1846 *Ammonites deslongchampsi* Defrance; d'Orbigny, p. 405, pl. 138, figs. 1 and 2.
1909 *Ammonites* (*Coeloceras*) *deslongchampsi* (d'Orb.); Douvillé, pl. 132.
1952 *Cadomites deslongchampsi* (d'Orb.); Arkell (1951–1958), p. 80, text-fig. 21.

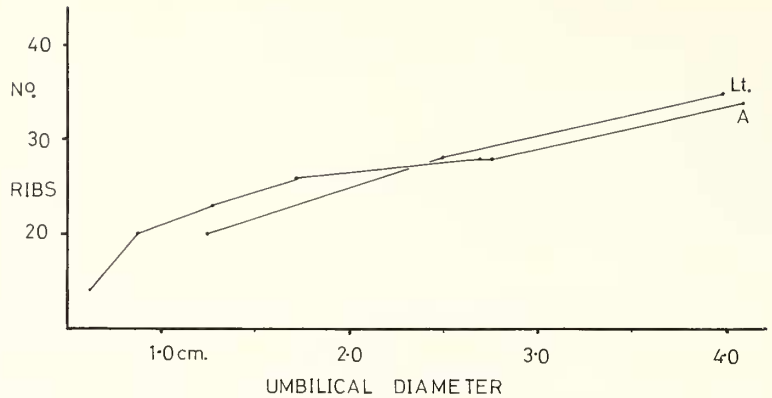
Material. One specimen, BMNH C 77767, collected by C. Cornfield from loc. 3.

Dimensions.

Diameter (D)	Whorl height (Wh)	Whorl width (Wb)	Umbilical diameter (Ud)	Number of primary ribs per whorl (Np)
10·4 cm	3·32 (32%)	3·94 (38%)	4·1 (39%)	44
8·8	3·4 (39%)	4·3 (49%)	2·76 (31%)	38

Description. A complete ammonite, showing the remains of a flared mouth border. The specimen has lost all the shell from its body chamber, but is well preserved on its inner whorls. A moderately coronate ammonite, it shows a distinct uncoiling and retraction of the body chamber, which extends for two-thirds of a whorl. The broadly arched venter is marked on the umbilical edge by sharp tubercules on the internal cast, and where shell is still preserved, spines. The long, sinuous primary ribs divide at the tubercules into three to five fine, slightly prorsiradiate secondaries. The primary rib density per whorl is only moderate for the genus, but it is strictly comparable with that of the lectotype of this species (see text-fig. 4).

Remarks. Allowing for the loss of shell, this specimen is very close to the lectotype of *C. deslongchampsi* figured in Palaeontologia Universalis (Douvillé 1909, No. 132) and later refigured by Arkell (1951–1958, p. 80). The lectotype from the Bayeux Oolite of Normandy is more likely to be Subfurcatum/Garantiana Zones in age than Parkinsoni Zone as suggested by Arkell (1951–1958, p. 79). The matrix, a densely 'iron-shot' oolitic limestone, corresponds more closely with this former horizon than with the Parkinsoni Zone, Truellei Subzone, which is represented in Normandy by a more sporadic 'iron-shot', the limonite ooliths being concentrated in clusters (Rioult 1964). This species is relatively common at the middle of the Subfurcatum Zone in the Sherborne area. Specimens very close to that figured here have been found recently at Oborne Wood, Sherborne (ST 648 188—see Whicher and Palmer 1971), in an horizon equivalent to bed 4, Frogden Quarry, Sherborne (Buckman, 1893,



TEXT-FIG. 4. Number of primary ribs per whorl, plotted against umbilical diameter, for *Cadomites deslongchampsi* (d'Orb.).

Lt. = lectotype, A = figured specimen, BMNH C 77767.

p. 500). This horizon falls within the Polygyralis Subzone of the Subfurcatum Zone (Parsons *in* Sturani 1971, p. 49). I have found no trace of the specimen recorded by Richardson as *Cadomites* aff. *deslongchampsi* from the Conglomerate Bed, in the Shepton Mallet Collections (Richardson 1908, p. 516) and it must be assumed lost.

Genus STEPHANOCERAS Waagen, 1869

Stephanoceras (*Stephanoceras*) sp.

Plate 36, fig. 2

1908 *Stepheoceras* aff. *umbilicus* (Quenstedt); Richardson, p. 517.

Material. One unnumbered specimen in the Shepton Mallet Museum.

Dimensions. Maximum diameter (wholly septate) = 5·8 cm. Due to distortion, whorl width and height measurements are not given.

D	Ud	Np
5·0 cm	1·8 (36%)	21
4·6	1·7 (37%)	22
—	0·8	20
	0·35	18

EXPLANATION OF PLATE 36

All specimens, except 1*a* and 1*b*, are coated with ammonium chloride.

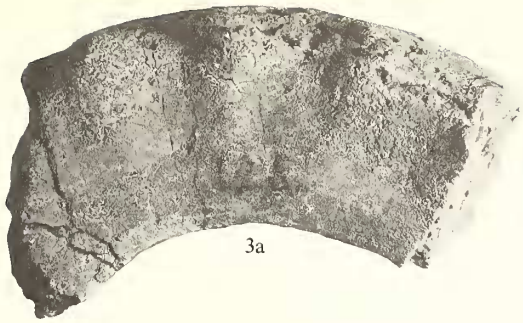
Fig. 1*a*, 1*b*. *Teloceras banksi* (J. Sowerby), BMNH C 7768. Doulting Conglomerate, Doulting Sheep-sleight, ×0·5.

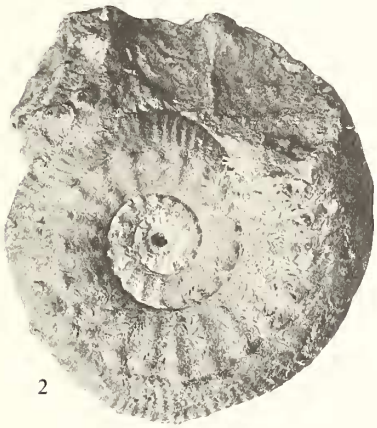
Fig. 2. *Stephanoceras* (*Stephanoceras*) sp. Shepton Mallet Museum (Doulting Conglomerate), ×1·0.

Fig. 3. *Leptosphinctes* (*Leptosphinctes*) aff. *davidsoni* (S. Buckman), Shepton Mallet Museum (Doulting Conglomerate), ×1·0.

Fig. 4*a*, 4*b*. *Cadomites* (*Cadomites*) *deslongchampsi* (d'Orb.), BMNH C 77767, Doulting Conglomerate, Doulting Sheep-sleight, ×0·5.

Fig. 5. *Strenoceras* (*Strenoceras*) cf. *subfurcatum* (Zieten), BMNH C 77769, Doulting Conglomerate, Doulting Sheep-sleight, oblique view, ×1·0.





PARSONS, English Bajocian ammonites

Description. A slightly distorted, coronate, stephanoceratid nucleus, which is totally septate. All the shell has been lost, there is thus no indication, in the form of 'continuation marks' as to its original maximum size. The primary ribs are fairly short, straight, and branch from a strong tubercule into three to four prorsiradiate secondaries.

Remarks. The primary rib density per whorl is low for this size of stephanoceratid nucleus. The closest match is with '*Stephanoceras*' *calix* (W. Smith), an uninterpretable lectotype of which has been figured by Cox (1930, pl. xii, fig. 10). However, the small size and poor state of preservation of the figured specimen, taken together with the high degree of variability found within the Stephanoceratidae, precludes anything other than the most open nomenclature being used here.

This specimen is probably the same as that recorded by Richardson as *S.* aff. *umbilicus* (Quenst.) (Richardson 1908, p. 517). The type specimen of the latter species is an uninterpretable nucleus and is in any case very different. The exact horizon and locality of this specimen are not recorded, but the characteristic matrix of the Conglomerate Bed is unmistakable.

Genus TELOCERAS Mascke, 1907

Teloceras (*Teloceras*) *banksi* (J. Sowerby)

Plate 36, fig. 1*a* and 1*b*; text-fig. 5

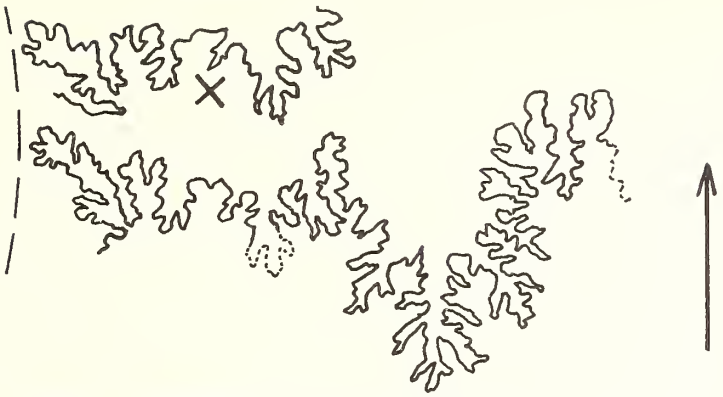
1818 *Ammonites banksi* n. sp. J. Sowerby, p. 229, pl. 200.
1909 *Ammonites banksi* (J. Sow.); S. Buckman and 'Secretary', pl. 1.
1926 *Teloceras banksi* (J. Sow.); S. Buckman, pl. 660, A and B.

Material. One large fragment of body chamber BMNH C 77768, a small fragment of an internal whorl, C 78542, and a specimen of a third of a septate whorl, C 78541.

Dimensions. The larger, figured specimen is part of the body chamber of an individual which when complete was greater than 23·0 cm in diameter. It is 12·0 cm long and has primary ribs 5·0–5·5 cm long, with a whorl height of 7·7 cm (*c.* 33%) and a whorl width estimated as 16·0 cm (*c.* 68%).

The second largest specimen (C 78541) has an estimated original diameter in the order of 14·0 cm with a whorl width of 12·1 cm (*c.* 86%) and a whorl height of 6·0 cm (*c.* 43%).

Description. The fragment figured here (C 77768—Pl. 36, fig. 1*a*, *b*) represents the first quarter of the body chamber of a large species of the genus *Teloceras*. It was found by C. Cornfield on Doulting Sheep-sleight (ST 642 422, Locality 2, text-fig. 3) along with another smaller fragment of an inner whorl (BMNH C 78542), which is less easily identified. The three surviving primary ribs of the larger specimen are weak and are terminated by large blunt tubercules or nodes. There is no evidence of secondary ribs on the outer part of the whorl, but the impression of the venter of the preceding whorl shows numerous fairly coarse secondaries. There is an 80° angle between the umbilical wall and the venter, on the line of the tubercules, which together with the very flat curves of both walls gives an almost square cross-section. The matrix of the figured specimen is well 'iron-shot' and contains numerous small limonite stained oncolites (average length 0·9 cm) as well as numerous macro-fossils; *Sphaeroidothyris sphaeroidalis* (J. de C. Sow.), *Pleuromya* sp. etc. The smaller fragment (C 78542) has stronger, coarser primary ribs, distinct secondaries, and a sharper angle between the umbilical wall and the venter, which is also more arched. This



TEXT-FIG. 5. A tracing of the suture of a specimen of *Teloceras banksi* (J. Sow.), BMNH C 78542.

specimen also shows a nearly complete suture (text-fig. 5), which is comparable to that of other species of *Teloceras* (see Weisert 1932, text-figs. 30, 35, 37).

The third specimen (C 78541) comes from an old collection in the Department of Geology, University of Liverpool, and has now been donated to the British Museum. It has an original label attached claiming Doulting as its source and this is confirmed by its matrix, which is characteristic of the Conglomerate Bed. This specimen, although wholly septate, is well preserved and represents approximately one-third of the penultimate whorl of a specimen of *Teloceras*. It has virtually obsolescent primary ribs and prominent tubercules, from which branch four to five secondaries.

Remarks. All the specimens discussed here are comparable with the holotype of *Teloceras banksi* (BMNH 43910) and also to numerous topotypes of this species, which it has recently been possible to collect from a temporary section near Sherborne, Dorset (Whicher and Palmer 1971), from beds equivalent to Buckman's bed 5 at Frogden Quarry (Buckman 1893). The identification of these fragments is beyond doubt since no other species of *Teloceras* shows such a pronounced retraction of the body chamber to give the square cross-section, nor such coarse primary ribs fading to nodes on the outer whorls.

Superfamily PERISPHINCTACEAE Steinmann, 1890
Family PARKINSONIIDAE Buckman, 1920
Genus STRENOCERAS Hyatt, 1900
Strenoceras (*Strenoceras*) cf. *subfurcatum* (Zieten)

Plate 36, fig. 5

1830 *Ammonites subfurcatus* Schlotheim, E. F. von, m.s.; Zieten, p. 10, pl. VII, fig. 6*a–c*.
1928 *Strenoceras* (*Strenoceras*) *subfurcatum* (Schloth.); Bentz, pl. 14, fig. 1.
1956 *Strenoceras subfurcatum* (Schl.); Arkell, pl. 35, fig. 6—selects lectotype.

Material. One specimen (BMNH C 77769) from the Conglomerate Bed of Doulting (ex. C. Cornfield Collection).

Dimensions.

D	Wh	Wb	Ud	Np
3·7 cm	1·16 (31%)	1·4 (38%)	*c.* 1·65 (*c.* 45%)	24

Description. This important specimen was found by C. Cornfield at the same locality as the preceding specimens (Locality 2, text-fig. 3). This ammonite, with a third of a whorl of body chamber, of which an oblique view is shown here (Pl. 36, fig. 5), is unfortunately lacking its inner whorls. Enough, however, remains to show that it is typical of the *Strenoceras* microconch group. The sharp primary ribs (there are no signs of secondaries) are slightly prorsiradiate and are surmounted by two tubercules, one two-thirds of the way up the whorl flank and the other, a stronger tubercule or spine, on the venter. The two rows of ventral tubercules are separated by a shallow sulcus, whilst the lateral tubercules tend to be linked by a spiral ridge similar to that seen in the type of *S. bajocense* (Defrance)—see Arkell, Kummel and Wright 1957, fig. 381. The rib density although only estimated for one whorl is slightly low, with coarser ribs than are seen in most species of this genus.

Remarks. This specimen is close in gross morphology to the type of *S. bajocense* (see above); it is, however, here included in *S. subfurcatum* since this is the oldest available specific name. It would seem likely that most of the subsequently described species of this genus, such as *S. niortensis* (d'Orb.), are junior synonyms of this latter species. The corresponding macroconch to this microconch group is *S.* (*Garantiana*) *baculata* (Quenstedt), both of these two dimorphs being common in the Subfurcatum Zone beds east of Sherborne, Dorset.

Subgenus ORTHOGARANTIANA Bentz, 1928

Strenoceras (*?Orthogarantiana*) sp.

Material. One specimen collected by C. Cornfield from the Doulting Conglomerate of Locality 2 (BMNH C 78543).

Dimensions.

D	Wh	Wb	Ud
5·8 cm	2·37 (41%)	2·25 (39%)	1·95 (34%)

Description. A poorly preserved, heavily weathered specimen, consisting of two-thirds of a whorl of body chamber, the inner whorls being missing. This ammonite is moderately involute and has flat whorl sides and a well-arched venter. There are long, slightly sinuous, prorsiradiate, primary ribs, which divide into two to three fine secondaries. Due to the weathered state of the specimen it is now impossible to tell whether these secondary ribs cross the venter, or if there was once a ventral smooth band present.

Remarks. This specimen is very badly preserved and it is difficult to determine whether it is an example of *Orthogarantiana* or *Garantiana*; the weight of evidence points to the former. This subgenus is common throughout most of the Subfurcatum Zone and ranges up to the very top of the Garantiana Zone.

Family PERISPHINCTIDAE Steinmann, 1890

Genus LEPTOSPHINCTES Buckman, 1920

Leptosphinctes (*Leptosphinctes*) aff. *davidsoni* (S. Buckman)

Plate 36, fig. 3; text-fig. 6

1881 *Perisphinctes davidsoni nov.*; S. Buckman, p. 602.
1883 *Perisphinctes davidsoni* S. Buck.; S. Buckman, pp. 144–145, pl. IV, figs. 1*ab*, *non* 2*ab*.
1921 *Leptosphinctes davidsoni* S. Buckman; Buckman (1909–1930), pl. 201.

Material. One unnumbered specimen *ex.* J. Phyllis Collection, Shepton Mallet Museum, and one specimen from the Richardson Collection, University of Reading (LRS 3094).

Dimensions.

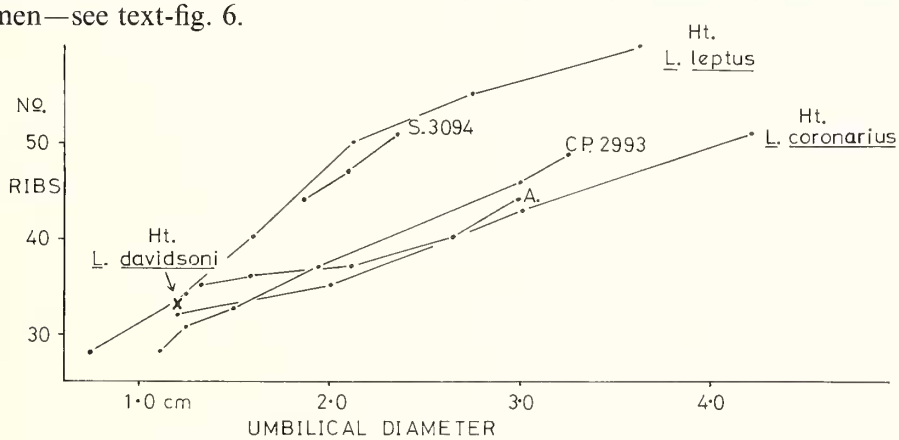
LRS 3094

D	Wh	Wb	Ud	Np
6·6 cm	2·0 (30%)	1·5 (23%)	3·4 (52%)	—
—	1·4	1·3	2·34	51
4·25	1·3 (31%)	1·24 (29%)	2·1 (49%)	47
—	—	—	1·87	44

Shepton Mallet Museum specimen

6·7 cm	—	—	2·99 (43%)	44
5·26	—	—	2·65 (50%)	40
			2·11	37
			1·59	36
			1·34	35

Description. Both of these specimens are wholly septate and rather poorly preserved; the Reading specimen has lost both its inner whorls and a third of its outer whorl, whilst the Shepton Mallet specimen is slightly crushed. The latter specimen is on the whole the best preserved and it is figured here (Pl. 36, fig. 3). Both of these specimens are finely ribbed, evolute, serpenticone ammonites, with flattened whorl sides and smoothly rounded venters. The primary ribs are sharp, long, and slightly prorsiradiate and branch on the inner whorls into two short secondary ribs, whilst on the outer whorls the secondaries are merely intercalated. The suture line is well shown on the figured specimen, which, however, shows no sign of any constrictions. The Reading specimen has one strong constriction on the last eighth of the last preserved whorl and it is also more finely ribbed, with a higher primary rib density than the figured specimen—see text-fig. 6.



TEXT-FIG. 6. Number of primary ribs plotted against umbilical diameter, for various species of *Leptosphinctes*.

Ht. = holotype, A = figured specimen in Shepton Mallet Museum.

Remarks. Both of these ammonites are really too small and poorly preserved for accurate identification. *Leptosphinctes davidsoni* (S. Buckman) is very close in style of ribbing, coiling, and whorl cross-section at equivalent diameters, hence this specific name is used in 'open' nomenclature. The Shepton Mallet specimen has a similar

primary rib density to that of the holotype of *L. davidsoni* (Manchester, L 11359), a recently collected topotype of the same species (CP 2993), and the holotype of *L. coronarius* S. Buckman (see text-fig. 6). The latter specimen is nothing but a smaller and less weathered specimen of *L. davidsoni*. The Reading specimen on the other hand is more finely ribbed and is a closer match to the holotype of *L. leptus* S. Buckman (IGS 32014—see text-fig. 6). However, until more is known of the variation within these species of *Leptosphinctes*, both the described specimens are here included in *L. davidsoni*. This species has recently been collected from beds equivalent to bed 5, Frogden Quarry (Buckman 1893) at Oborne Wood, Sherborne, Dorset; that is from the Banksi Subzone of the Subfurcatum Zone.

CORRELATION OF THE DOULTING CONGLOMERATE BED AND ITS FAUNA

The ammonite fauna recorded here from the Doulting Conglomerate Bed can only be correlated with the basal Banksi Subzone of the Subfurcatum Zone (see Table 1). Recent work has shown that there is a considerable overlap of Stephanoceratid ammonites, such as *Teloceras*, with Perisphinctids at the base of the Subfurcatum Zone in both the French Basses Alps (Pavia 1969, p. 447, text-fig. 2) and in Dorset (Parsons 1970). The coexistence of *Stephanoceras*, *Teloceras*, *Leptosphinctes*, and *Strenoceras* in the same bed is thus by no means unùsual; it is typical of the Banksi Subzone and it mirrors a similar occurrence at Chaudon, near Digne, south-east France (Pavia 1969, p. 447). The Banksi hemera as erected by Buckman (1910, 1909–1930) was based on the 'iron-shot' limestones exposed at Frogden Quarry, near Sherborne (ST 642 185), although he never clearly stated this (Morley Davies *in* Richardson 1930, p. 48). This hemera thus has precedence over the Aplous Subzone of the Subfurcatum Zone (Pavia and Sturani 1968), which is a junior synonym (Parsons *in* Sturani 1971). Banksi Subzone faunas can still be collected from Frogden and they prove to be very similar to both those collected from equivalent beds at Oborne Wood, Sherborne, Dorset (Whicher and Palmer 1971), and to the fauna described here.

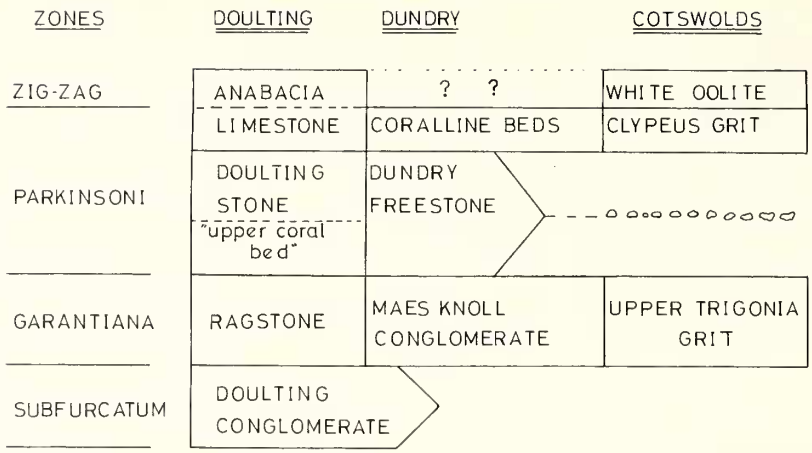
The 'iron-shot' matrix of the Conglomerate Bed, together with the common yellow stained oncolites, is highly distinctive and it enables one to trace it in field rubble. The most northerly point at which the Conglomerate Bed appears to be preserved is in the valley to the west of Doulting. To the south, 'iron-shot' field rubble is present for some distance past locality 3 (see text-fig. 3). Whilst sparsely 'iron-shot' limestones are present at the base of the Inferior Oolite in the valley near Higher Alham (at the far south-east corner of text-fig. 3), it is impossible to be certain of their age as no diagnostic ammonites have been found *in situ*. In this connection it is interesting to note that a single, large specimen of *Teloceras banksi* (at least 30 cm in diameter) has been found in loose material from a dry stone wall near Chesterblade (Locality 4, text-fig. 3). This ammonite has a sandy, slightly 'iron-shot' matrix, very like that of the basal Inferior Oolite at Higher Alham and further south at Batcombe (Richardson 1916). It is thus a distinct possibility that the basal members of the Inferior Oolite south of Chesterblade are also Subfurcatum rather than Garantiana Zone in age. Additional evidence for this correlation is given by the occurrence of

Subfurcatum Zone ammonites in the base of the Sherborne Building Stone Series (see text-fig. 2), at Oborne Lane section (ST 656 186; Buckman 1893, p. 502) and Milborne Port (Kellaway and Wilson 1941, p. 154). The Sherborne Building Stone is mainly Garantiana Zone in age and at Frogden and Oborne Wood it rests unconformably on 'iron-shot' and highly condensed Subfurcatum Zone beds. It thus seems that to the east the Subfurcatum Zone beds become sandier and thicker and are thus indistinguishable from the overlying Garantiana Zone beds (see text-fig. 2). This may well be what has occurred in the Batcombe district.

CORRELATION OF THE UPPER INFERIOR OOLITE NORTH OF THE MENDIPS

There can be little doubt that the extensive transgression at the base of the Upper Bajocian, which is marked by prominent 'hard-grounds' and unconformities over much of southern England, commenced prior to the Subfurcatum Zone rather than the Garantiana Zone. The occurrence of Subfurcatum Zone rocks well to the north of the Sherborne area discredits Morley Davies's concept of a north-westerly overlap of the Sherborne rocks by subsequent strata (Morley Davies 1930, p. 232) and confirms Buckman's concept of the existing outcrops of Subfurcatum Zone rocks being the remnant of once more extensive areas of deposition (Buckman 1923, *in* 1909–1930, p. 54). Since Doulting is so close to the Mendips there is no reason to doubt that the major inundation of this latter area, which is marked by the transgressive nature of the Upper Inferior Oolite, commenced also prior to the Subfurcatum rather than the Garantiana Zone.

The traditional correlation of the Doulting Conglomerate with the Cotswold Upper Trigonia Grit has now proved to be untenable. The rock at Doulting which in fact belongs to the Garantiana Zone is the Ragstone or Rag Bed. This bed has yielded sufficient fragmentary ammonites to enable a provisional correlation to be made with the upper Garantiana Zone. The Ragstone is exposed at the very base of the quarry near Cheylinch (ST 649 435), where it has produced ?*Spiroceras* sp. and *Prorsisphinctes* sp. This bed is the reputed type horizon for *Prorsisphinctes* ('*Glyphosphinctes*') *glyphus* (S. Buckman 1925, *in* 1909–1930, pl. 544), which is very close to, if not conspecific with *Prorsisphinctes* ('*Stomphosphinctes*') *stomphus* (S. Buckman 1921, *in* 1909–1930, pl. 247), which as a species is characteristic of the Astarte Bed of south Dorset and which is upper Garantiana Zone in age. The dating of the Conglomerate Bed is of considerable interest, since it rules out the possibility of the basal unconformity beneath the Ragstone being on the horizon of the supposedly missing Dundry Freestone and Coralline beds of Dundry Hill near Bristol, a correlation suggested by Richardson (1907, p. 386). Taking into account the restrictions placed on any correlations by the Parkinsoni/Zig-Zag Zonal boundary falling within the Anabacia Limestones (Torrens 1969*b*), there seems no alternative but to assume that the Dundry Freestone is the lateral equivalent of the Doulting Freestone; there thus is very little missing at Doulting. A possible recorrelation of the Upper Inferior Oolite north of the Mendips is given here in diagrammatic form (text-fig. 7). The discussion of the detailed ammonite evidence for the changes suggested here is on the whole beyond the scope of this work. However, what must be mentioned is that the ammonite



TEXT-FIG. 7. A revised correlation of the Upper Inferior Oolite from the Mendips north to the Cotswolds.

faunas from the Upper Trigonia Grit of the Cotswolds, mainly *Garantiana s. str.* (e.g. *Strenoceras* (*Garantiana*) cf. *garantiana* (d'Orb.), BMNH C 8839, Rodborough Hill, near Stroud) and early Parkinsonids (e.g. *Parkinsonia* (*P.*) *rarecostata* (S. Buckman), BMNH C 9171, Long Wood, near Stroud), would point to a correlation with the upper Garantiana Zone, Acris Subzone (Pavia 1973, p. 88, text-fig. 2). This might suggest that the Upper Bajocian transgression north of the Mendips occurred at a slightly later date than the pre-Subfurcatum Zone transgression to the south.

Acknowledgements. The main part of this work was carried out during the tenure of a University of Keele Research Studentship and this award is gratefully acknowledged. I would like to thank Mr. C. Cornfield who donated several of the ammonites described here, as well as the curators of the Shepton Mallet and Reading University Museums for the loan of material. Finally, I should like to thank Dr. H. Torrens for his help and encouragement throughout the course of this work.

REFERENCES

ARKELL, W. J. 1951–1958. A Monograph of the English Bathonian Ammonites. *Palaeontogr. Soc. Monogr.* 264 pp., 33 pls.

—— 1956. *Jurassic Geology of the World.* Oliver & Boyd, Edinburgh and London, pp. xv+804.

—— KUMMEL, B and WRIGHT, C. W. 1957. Mesozoic Ammonoidea. In *Treatise on Invertebrate Paleontology*, part L. Geol. Soc. Amer. and Univ. Kansas Press, pp. xxii+490, 558 text-figs.

BENTZ, A. 1928. Uber Strenoceraten und Garantianen insbesondere aus dem Mittleren Dogger von Bielfeld. *Jb. Preuss. Geol. Landesanst.* **49**, 138–206, pls. 14–19.

BUCKMAN, S. S. 1881. A descriptive catalogue of some of the species of ammonites from the Inferior Oolite of Dorset. *Q. Jl geol. Soc. Lond.* **37**, 588–608.

—— 1883. Some new species of ammonites from the Inferior Oolite. *Proc. Dorset Nat. Hist. Archaeol. Soc.* **4**, 137–146, pls. I–IV.

—— 1893. The Bajocian of the Sherborne district. *Q. Jl geol. Soc. Lond.* **49**, 479–522.

—— 1910. Certain Jurassic (Lias–Oolite) strata of the South Dorset. Ibid. **66**, 52–89.

—— 1909–1930. *Type Ammonites.* London and Thame, **1–7**, pls. 790.

—— and 'SECRETARY'. 1909. Illustrations of Type Specimens of Inferior Oolite ammonites in the Sowerby collection. *Palaeontogr. Soc.*

COX, L. R. 1930. On British fossils named by William Smith. *Ann. Mag. Nat. Hist.* (10), vi, 287–304, pl. xii.

DOUVILLÉ, R. 1909. In *Palaeontologia Universalis*, ser. II, fasc. 4, no. 132.
GATRALL, M., JENKYNS, H. C. and PARSONS, C. F. 1972. Limonitic concretions from the European Jurassic, with particular reference to the 'Snuff-boxes' of Southern England. *Sedimentology*, **18**, 79–103.
HUDLESTON, W. H. and WOODWARD, H. B. 1885. Excursion to Sherborne and Bridport. *Proc. Geol. Ass.* **9**, 187–209.
KELLAWAY, G. A. and WILSON, V. 1941. An outline of the Geology of Yeovil, Sherborne and Sparkford Vale. Ibid. **52**, 131–174, pls. 9–10.
LEE, G. W. 1920. The Mesozoic rocks of Applecross, Raasay and North-East Skye. *Mem. geol. Surv. U.K. (Scotland)*.
MORLEY DAVIES, A. 1930. The Geological Life Work of Sidney Savoury Buckman. *Proc. Geol. Ass.* **41**, 95–113.
MORTON, N. 1971. Some Bajocian ammonites from Western Scotland. *Palaeontology*, **14**, 266–293, pl. 12.
ORBIGNY, A. D'. 1842–1851. *Paléontologie Française; Terrains jurassiques*, I *Céphalopodes*. Paris.
PARSONS, C. F. 1970. A recent exposure at the Humphriesianum/Subfurcatum Zonal boundary in North Dorset. *Proc. Dorset Nat. Hist. Archaeol. Soc.* **91**, 41.
PAVIA, G. 1969. Nouvelles donnés sur le Bajocian de Digne (Basses-Alpes). *Boll. Soc. Geol. It.* **88**, 445–451.
—— 1973. Ammoniti del Baiociano Superiore di Digne. *Boll. Soc. Pal. It.* **10**, 75–142, pls. 13–29.
—— and STURANI, C. 1968. Étude biostratigraphique du Bajocien des Chaines Sub-alpines aux environs de Digne (Basses-Alpes). *Boll. Soc. Geol. It.* **87**, 305–316.
RICHARDSON, L. 1907. The Inferior Oolite and contiguous deposits of the Bath–Doulting district. *Q. Jl geol. Soc. Lond.* **63**, 383–423.
—— 1908. On the Phyllis Collection of Inferior Oolite fossils from Doulting. *Geol. Mag.* Dec. 5, **5**, 509–517.
—— 1916. The Inferior Oolite and contiguous deposits of the Doulting–Milborne-Port district (Somerset). *Q. Jl geol. Soc. Lond.* **71**, 473–520, pls. xl–xliii.
—— 1930. The Inferior Oolite and contiguous deposits of the Sherborne district (Dorset). *Proc. Cotteswold Nat. F. Club*, **24**, 35–85, pls. vi–xi.
RIOULT, M. 1964. Le Stratotype du Bajocien. *Colloque du Jurassique, Luxembourg*, 1962. Publ. Inst. Grand-Ducal Luxembourg, Sect. Sci. Nat., Phys. Math., pp. 239–258.
STAMP, L. DUDLEY. 1925. Practical aspects of correlation—a criticism. *Proc. Geol. Ass.* **36**, 11–25.
SOWERBY, J. and SOWERBY, J. DE C. 1812–1846. *The Mineral Conchology of Great Britain*. London, vols. 1–7, 648 pls.
STURANI, C. 1971. Ammonites and Stratigraphy of the 'Posidonia alpina' beds of the Venetian Alps. *Memoir Ist Geol. Mineral. Univ. Padova*, **28**, 1–190, pls. i–xvi.
TORRENS, H. S. 1969*a*. (ed.). *Guide for Dorset and South Somerset*. International Field Symposium on the British Jurassic, excursion guide. University of Keele, 71 pp., 38 figs.
—— 1969*b*. *Guide for North Somerset and Gloucestershire*. Ibid. 46 pp., 15 figs.
WEISERT, K. 1932. Stephanoceras im Schwäbischen Braunen Jura Delta. *Palaeontographica*, **76**, 121–191, pls. XV–XIX.
WHICHER, J. T. and PALMER, C. P. 1971. Preliminary description of a temporary exposure in the Middle Inferior Oolite, near Sherborne, Dorset. *Proc. Dorset Nat. Hist. Archaeol. Soc.* **92**, 110–119.
ZIETEN, C. H. DE. 1830–1833. *Les Petrifactions de Wurtemberg*. Stuttgart, 102 pp., 72 pls.

C. F. PARSONS
Department of Geology
University of Liverpool
P.O. Box 147
Liverpool L69 3BX

Typescript received 30 January 1974
Revised typescript received 20 May 1974